

***Interactive comment on “Coccolithophore
response to climate and surface hydrography in
Santa Barbara Basin, California, AD 1917–2004”
by M. Grelaud et al.***

M. Grelaud et al.

Received and published: 4 March 2009

We thank Regina Krachler for her constructive criticism that helped to improve the manuscript substantially.

1- Page 4143 line 24: (The authors wrote: When the pH is controlled by CO₂ injection, rather than by acid addition, the production of dissolved inorganic carbon (DIC) is greater and the production of bicarbonate which is the source of DIC for calcification in coccolithophores is enhanced.)



Increasing pCO₂ shifts the above equilibrium to the left side, leading to higher DIC and

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Ca²⁺ concentrations, provided that solid CaCO₃ is present (e.g. colloidal particles) which can act as a reaction partner. However, with no suspended CaCO₃ particles in the water column, addition of CO₂ will shift the pH as well as the carbonate concentration to lower values, creating less favourable conditions for calcification, since carbonate rather than bicarbonate is needed for the precipitation of CaCO₃. On the other hand, coccolithophores need CO₂ to carry out photosynthesis, and their productivity may be controlled by the availability of CO₂. Increasing pCO₂ in seawater could therefore be compatible with an increase in coccolith weight.

Answer: we completely agree that the CO₂ should help the algae for photosynthesis. However the link between photosynthesis and calcification is not clear, the coccolithophores using essentially bi-carbonate to precipitate the calcium carbonate. Moreover there are no apparent exchanges of carbon during the process. Our results suggest that an increase in pCO₂ and pH could be favorable to calcification of coccolithophores. Equivalent results have been described by Iglesias-Rodriguez et al. (2008).

Reference:

Iglesias-Rodriguez, M. D., Halloran, P. R., Rickaby, R. E. M., Hall, I. R., Colmenero-Hidalgo, E., Gittins, J. R., Green, D. R. H., Tyrrell, T., Gibbs, S. J., von Dassow, P., Rehm, E., Armbrust, E. V., and Boessenkool, K. P.: Phytoplankton Calcification in a High-CO₂ World, *Science*, 320, 336-340, 10.1126/science.1154122, 2008.

Interactive comment on Biogeosciences Discuss., 5, 4129, 2008.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)